Multi-Layered Integrated Airframe System

Fiber Materials, Inc.

Technical Abstract
This proposed Phase II program builds on the Phase I effort addressing NASA's future mission requirements by: 1) developing higher performing TPS materials capable of meeting the demands of multiple severe mission trajectories; and 2) integrating TPS materials with the sub-structure to improve overall robustness and decrease mass. The program's goal is to extend Phenolic Impregnated Carbon Ablator (PICA) and Fiber Materials, Inc. (FMI^{REG}) Integrated Composite Structure (ICS) TPS materials to a broader range of flight heat fluxes and mission performance requirements to address future heatshield design needs. Specific mission enabling improvements sought by NASA that will be developed and/or demonstrated under this Phase II program include: preform/component size, ablation performance, thermal insulation performance, efficient and extendable assembly process, and net-shape preform casting.

Company Contact
Paul Martin
(207) 282-5911
bdwyer@fibermaterialsinc.com

2009 Phase II
Proposal X9.02-8827

Advanced Integrated Hypersonic Entry Systems

Integrated Inflatable Ballute for Planetary Entry

CFD Research Corporation

Technical Abstract
CFDRC and TRLA are proposing to develop, design and test a highly scalable, mass-optimized inflatable structure that makes maximum utilization of materials in providing tailored stiffness and rigidity for hypersonic entry vehicles. The proposed inflatable structure is a hybrid pressure restraint vessel employing an impervious cloth-reinforced barrier structure enveloped by an integrated array of high-tenacity tendons. The external grid of cordage tendons provides mass- and load pathway-optimized containment of the structure's global pressure loads. In Phase I, the conceptual model was designed and the materials were evaluated for their stiffness. The feasibility of the model was demonstrated for typical Mars trajectory point. Phase II efforts will focus on fabricating and testing a prototype of the proposed inflatable structure to validate the design robustness and capability for larger payload masses. Pre and post testing multidisciplinary integrated fluid-structure-thermal simulations will be conducted to provide insight into the aerodynamic, material stress and dynamic characteristics of the model and to verify/optimize the developed design. Wind tunnel testing as well as dynamic aerostructural simulations will be conducted to verify the stability of the model. The developed inflatable concept will be fabricated complete with flexible TPS, multiple protection layers and sensors and will be tested to demonstrate the prototype folding, packaging, and deployment.

Company Contact
Essam Sheta
(256) 726-4869
sxh@cfdrc.com

2009 Phase II
Proposal X9.02-9443